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ABSTRACT

Children's acquisition of the mass-count distinction in English was investigated. In order to determine whether children approach the distinction as a morphosyntactic or a semantic distinction, 88 monolingual children aged 3-9 years were asked to judge the acceptability of 32 sentences containing "much" or "many" with 8 types of nominals. The results suggest that a prolonged development of the mass-count distinction in English begins as early as age 3 and may not be completed until after age 9. By age 6 or 7, children may be aware of the correct forms of mass and count nouns when they occur in quantified constructions. There is some indication that by age 8, children may progress to a more semantic understanding of the distinction, in which nominal forms become more flexible in distribution and the mass-count distinction is transferred to the quantifiers modifying those nouns. (RW)

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The Mass-Count Distinction: Children's Use of Morpho-Syntactic vs. Semantic Approaches*

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The purpose of this study was to further explore the child's acquisition of the mass-count distinction in English. The mass-count distinction can be characterized as a semantic or morpho-syntactic distinction that applies to nouns and their quantifiers. Mass nouns generally refer to homogeneous, non-individuated substances (e.g., water) and can occur with the quantifiers much and little, as in John has so much water and Tom used too little ice. Count nouns generally refer to heterogeneous, individuated objects (e.g., books) and can occur with the count quantifiers many and few, as in John has so many books and Tom used too few rocks.

The first goal of the study was to determine the age at which children learn the mass-count distinction in English. Previous studies have yielded mixed information on the child's knowledge of the mass-count distinction. Brown (1970) tested children's interpretations of a/another vs. some/any in combination with nonsense words, and he reported that 3- to 5-year-olds correctly chose an individual object in response to questions such as "Can you show me another sib?" 68.75% of the time. In response to phrases such as "Show me some sib," they chose a substance with 75% accuracy. However, an examination of children's spontaneous production of constructions in which they use much and many reveals that children at these ages and beyond often err in their use of these quantifiers. Specifically, the mass quantifier, much, is often used where many is required, as in "Mommy, look how much checkers I got" (Rachel, 4;8) and "Somebody gave me too much Cheerios" (Jaime 5;3) (see Gathercole 1979 for further examples). Further, in a study of children's understanding of more, the neutralized comparative form for much and many, I found that when children were forced to choose between mass and count interpretations of more N, where N was either a mass or count noun, 3- and 4-year-olds responded at random, and 5- to 6-year-olds tended to treat all uses of more N as referring to relative countable amounts (Gathercole 1981).

The second goal of the study was to discover whether the child approaches the mass-count distinction as a morpho-syntactic one or as a semantic one. That is, does the child learn, for example, that much "goes with" nouns X, Y, and Z, and many "goes with" nouns A, B, and C, or does he learn that nouns X, Y, and Z share with much reference to a non-individuated mass, and nouns A, B, and C and the quantifier many share reference to individuated objects? The exact nature of the mass-count distinction even in the adult language has been the subject of intense debate in the linguistic and philosophical literature (Cartwright 1970, Denny 1976, McCawley 1975, 1981, Moravcsik 1973, Parsons 1970, Pelletier 1979, Quine 1960, Sharvy 1978), revealing the complexities of analysis and potential alternative routes the child may take in acquiring this distinction.

Method

For the study, 88 monolingual children aged 3;6 to 9;0, divided into

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11 groups at half-year intervals, were tested. A "puppet correction" procedure, in which the child was invited to operate a puppet that corrected a "funny-talking" puppet's speech, was used to test children's judgments of the acceptability of a variety of mass and count constructions. After a training procedure, in which children were taught to judge the acceptability of sentences according to models presented by the experimenter, each subject was presented with 32 test items in which much and many occurred with eight types of nominals. The eight types were the following:

A. Prototypical Mass Nouns: mass nouns that refer to objects that are homogeneous and have no discernible minimal parts (i.e., one could chop the object up and still use the same noun to refer to the pieces remaining). Nouns used: water, clay, dirt, smoke.
B. Prototypical Count Nouns: count nouns that refer to objects that have heterogeneous makeup and come in individuated units that constitute minimal parts (i.e., one could not cut the object up and still refer to the remaining pieces with the same noun). Nouns used: boy, finger, tree, book.
C. Non-prototypical Mass Nouns: mass nouns that refer to objects that typically come in individuated, countable pieces. Nouns used: bread, money, chalk, ice.
D. Non-prototypical Count Nouns: count nouns that refer to objects with homogeneous makeup. One could break up the object and still refer to the remainder with the same noun. Nouns used: rock, noodle, crayon, stick.
E. Flexible Nouns: nouns that have standard mass and count senses. Nouns used: cake, glass, hamburger, fire.
F. Opaque Nouns: nouns whose phonological shapes might suggest that they are plural when they are singular, or vice-versa. Nouns used: mass: wax, cheese; count: teeth, children.
G. Nominal Measure Words: NMW's are words that might be considered neither mass nor count (Sharvy 1978), but typically provide a "measure" for quantifying mass or count quantities. NMW's occur in count-type constructions. NMW's used: pile of fish, heap of fish, stack of fish, handful of fish.
H. Nonsense Words: forms used: smay, koodge, blick, tiv.

Each subject received each type of noun once in the singular and once in the plural with both much and many. In addition, the quantifiers were systematically modified by one of eight determiner patterns: so, this, that, as...as the ghost, how (+ interrogative), ∅ (+ interrogative), too (+ negative), and ∅ (+ negative). The use of these determiners was balanced across the occurrence of much and many with the eight noun types in singular and plural forms. Finally, eight sentence frames were used, shown in (1), randomized with the constraint that each subject heard each sentence frame twice with much and twice with many, twice with a singular noun, twice with a plural noun, and no more than once with a given determiner. Examples of stimuli are shown in (2).

(1) a. Big Bird saw ...
b. We have ...
c. Mickey Mouse drew ...
d. Grover needs ...
e. The monster swallowed ...
f. Bert and Ernie found ...
g. The giant wants ...
h. Oscar took ...

(2) a. We have so much fingers.
b. Big Bird didn't see much cheese.
c. Grover doesn't need too many clays.
d. Bert and Ernie found as many rock as the ghost.

Three sets of predictions were made. The first set related to the question of how the child approaches the mass-count distinction. If the child approaches the mass-count distinction as a semantic one, performance on noun-types A and B should be better than on types C and D, performance on noun-type F should be good, and performance on type H should be poor. If, on the other hand, the child treats the occurrence of much and many with certain nouns as a morpho-syntactic, or distributional, characteristic of those forms, then performance on all noun-types except type F should be good. Finally, as an alternative approach, the child might learn the mass-count status of each noun individually. If so, performance on individual nouns in A through G should vary, and there should be no significant differences across these noun-groups. However, performance on type H should be poor.

The second set of predictions had to do with the child's performance on the tasks of this study as compared with his production of errors like those cited above. When the child makes errors such as "that much plates," it may be because he has not yet acquired the distinction between much and many. If so, the subjects in this study should ignore errors in the use of much and many at comparable ages. Alternatively, children's production errors may not reflect a lack of knowledge about the use of much and many, but, rather, limitations of performance. The child may, in searching for one of the two quantifiers to relay his message, simply use the first one he encounters. The dominance of much as his choice could be explained in terms of the unmarked status of that quantifier. If this alternative is the case, then subjects in the present study should perform well in judging misuses of much and many, even at the ages at which children produce errors in their spontaneous speech.

Finally, because of the unmarked status of much, children may notice errors with many before they notice errors with much.

Results

The data were analyzed according to the accuracy of the children's judgments and the types of corrections made. Two main analyses of the children's judgments were made. First, children's responses to the eight noun-types across ages were analyzed. A significant main effect of age was found ($F_{10,68}=6.19$, $p<.001$). Performance at each age was as follows: 3½: 43.8%, 4: 48.1%, 4½: 43.8%, 5: 45.8%, 5½: 55.1%, 6: 49.2%, 6½: 59.0%, 7: 66.4%, 7½: 72.3%, 8: 70.7%, 8½: 73.0%. Further analysis (Duncan's Multiple-Range Test) revealed significant differences at $p<.05$, first, between 3½-, 4-, and 4½-year-olds, on the one hand, and 5½-year-olds and older, on the other; secondly, between 5- and 6-year-olds, on the one hand, and the older children, on the other; between 5½- and 6½-year-olds and the older children; and, finally, between 7-year-olds and 7½- and 8½-year-olds. A significant main effect of noun-type was also found ($F_{7,476}=11.69$, $p<.001$), with performance on A (63.9%), B (65.1%), C (65.2%), D (65.5%), and E (60.5%) equivalent and better than performance on F (51.4%), G (47.9%), and H (46.8%). Finally, a significant interaction between noun-type and age was also found ($F_{70,476}=1.35$, $p<.05$), due to children's relatively poor performance at 6½, 8, and 8½ years of age on the nonsense

stimuli.

The data show, then, that the children performed equally well on noun-types A through E, but more poorly on F through H. Equivalent performance on A through E, in conjunction with poor performance on F, indicates that subjects responded according to the surface distribution of forms, rather than according to the semantic content of the various nouns and noun-types. Poor performance on type H suggests that experience with the noun in question also plays a role in the child's responses. The difficulty children experienced with type G appears to be attributable, at least in part, to a difficulty in storing and processing the sentences of that type. Some of the sentences became quite long and unwieldy.

The second set of analyses performed concerned responses to *much* and *many* in conjunction with the singular and plural forms of the mass and count nouns of types A through G across ages. There was a significant difference in responses to *much* and *many*, with better performance on *many* (64.5% vs. 55.0%) ($F_{1,77}$=26.01, $p<.001$). The analysis also revealed a second main effect of the noun form ($F_{3,231}$=119.58, $p<.001$), with performance on plural count nouns (54.6%) below performance on singular count nouns (63.3%), singular mass nouns (62.7%), and plural mass nouns (61.4%), and a significant interaction between noun forms and quantifiers ($F_{3,231}$=28.3, $p<.001$), due to poor performance on plural count nouns with *much* (35.7% correct, compared with 55.6% to 73.4% correct on each of the other forms). Finally, a significant interaction of age X noun form was found ($F_{30,231}$=2.03, $p<.01$). This interaction was due to uncommonly high performance at 3½ and 4 on plural count and singular count nouns, respectively. This is attributable to several children's perseverating with "correct" or "incorrect" responses at these ages.

If the eight quantifier X noun-form pairs are ranked according to overall accuracy, they appear as shown on the left side of Table 1. If we compare this ranking with the ages at which children's accuracy first reaches 68% or greater and remains consistently high thereafter, we find that the overall general trend is followed in the progression across ages, as shown in column 2. On close examination of these figures, the factors influencing the children's judgments become quite clear. In the third column, each of the eight items ranked in Table 1 is marked for the appropriateness of the number marking and of the quantifier used, given a count or mass noun. This third column reveals, first, that children responded according to the number of the noun before they responded according to the choice of quantifier. The children responded well at an early age (5;0) to the first two types of construction, in which the form of the noun was correct, and that of the quantifier, too, but poorly to the last two items, in which the form of the noun was correct, but the quantifier incorrect. The items between these two extremes all contained incorrect forms of the noun, and the subjects showed greater success in judging these items incorrect than they did with the last two.

Table 1 also reveals slightly better performance on count nouns than on mass nouns, except in the case of plural count nouns with *much*. Note that for the intermediate pairs of items on the list (3 to 6), children performed better on the count item, or performed well at an earlier age, than on the corresponding mass item. In the third and fourth types of construction, the noun-form is incorrect, but the quantifier is appropriate; here, children performed well by 6½ on the count form, but did not

TABLE 1

Quantifier + noun forms ranked according to overall accuracy.

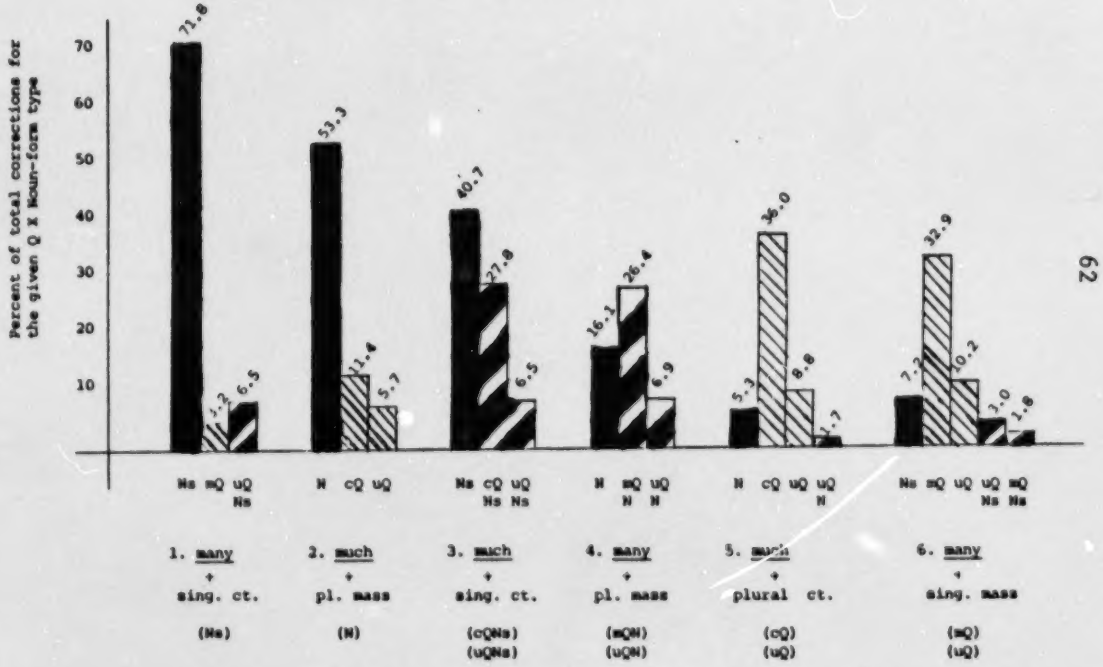
	Quantifier + Noun form	Age at which accuracy first reaches 68% or greater and remains consistently high	Appropriateness of form, given mass or count noun	
			N shape	Q
1.	many + plural count (73.4%)	5;0 (79.2%)	C	C
2.	much + singular mass (71.2%)	5;0 (70%)	C	C
3.	many + singular count (68.8%)	6;6 (87.5%)	I	C
4.	much + plural mass (67.5%)	6;6 (62.5%) or 7;0 (81.3%)	I	C
5.	much + singular count (57.8%)	6;6 (69.6%)	I	I
6.	many + plural mass (56.4%)	7;0 (68.8%)	I	I
7.	many + singular mass (55.6%)	7;6 (78.1%)	C	I
8.	much + plural count (35.7%)	[8;6 (52.5%)]	C	I

FIGURE 1

Major types of corrections, according to quantifier X noun-form, noun-types A to F.

Symbols represent corrections as follows:

N : form of the noun changed to singular
Ns : form of the noun changed to plural
mQ : quantifier changed to much
cQ : quantifier changed to many
uQ : quantifier changed to an unmarked quantifier (some, a lot of, any)
mQN : change to much and singular noun
cQNs : change to many and plural noun
uQN : change to unmarked quantifier and singular noun
uQNs : change to unmarked quantifier and plural noun



(Symbols in parentheses indicate changes that would produce correct forms.)

do as well on the mass form until 7;0. Similarly, in the following two items, both the noun-form and the quantifier were inappropriate, and, again, the children responded well to the count form before they did so to the mass form. For the last two constructions, the pattern is reversed. In both cases, the noun-form is correct, but the quantifier is inappropriate. The recognition of errors of type 7 before those of type 8 indicates that children learn that many is restricted to use with plural nouns before they learn that much is restricted, at least in direct noun modification, to use with singular nouns.

Thus, children's judgments indicate that they pay attention to the forms of nouns before they pay attention to the choice of quantifier, and that they are better at judging the forms of count nouns than they are at judging those of mass nouns. A close examination of the corrections made by the children offers support for these conclusions. The major types of corrections offered for each incorrect quantifier X noun-form type are shown in Figure 1. The children's prior attention to the noun-form over the quantifier used is reflected in two ways. First, the children were most successful at appropriately correcting those items that were incorrect only in their noun-form (types 1 and 2 on the Figure). Secondly, when both the noun-form and the quantifier needed to be changed in order to produce a correct construction (items 3 and 4), the subjects often corrected only the noun form and rarely corrected only the quantifier form.

The better performance on judging the forms of count nouns over those of mass nouns is similarly paralleled by a better performance at correcting the forms of count nouns than those of mass nouns. Children were able to correct many+a singular count noun (#1, Fig. 1) to many+a plural count noun more often than they were able to correct much+a plural mass noun (#2) to much+the singular form of that mass noun. Similarly, children corrected much+a singular count noun (#3) to a form with a plural count noun more often than they corrected many+a plural mass noun (#4) to a form with a singular mass noun.

These results, then, lead to the following conclusions. First, children begin learning the mass-count distinction as it applies to much N and many N, not as a semantic one, but as a morpho-syntactic distinction. They appear to first learn the appropriate forms of nouns and then to associate the quantifiers with the already established forms of the nouns, associating many with plurals long before they restrict much in direct noun-modification to use with the singular. Secondly, children do not learn that much and many have restricted privileges of occurrence until around 7½ years of age. Thus, production errors in the use of much and many like those cited above appear to accurately reflect the child's lack of knowledge about the use of these terms. Thirdly, children do indeed recognize errors in the use of many before they recognize errors in the use of much -- in particular, those errors involving correct plural forms of count nouns.

Apart from these major results, there are some hints in the responses of the oldest children of a turning away from a strict adherence to a given form of nouns towards greater flexibility in the use of nouns in the singular or plural. In particular, there is evidence of less insistence on the use of mass nouns in the singular, and movement towards allowing them to occur in the plural with many. First, at age 8;0, 21.7% of the children's corrections of many+a singular mass noun (e.g., many water)

were changes of the noun to a plural form (cf. an average of 7.2% this type of correction across the ages). E.g., Lara (8;2) changed "How many chalk do we have?" to "How many chalks do we have?" and Jennifer (8;4) changed "The monster swallowed this many smoke" to "The monster swallowed this many smokes." Similarly, at 8 and 8½, 19.4% of the children's corrections of much+a plural mass noun were changes of the quantifier to many. E.g., Jennie (8;11) changed "The giant wants so much dirts" to "The giant wants so many dirts." And at 8½, 35.7% of those children who judged many+a plural mass noun (e.g., many dirts) to be deviant said that they didn't know how to change it, occasionally remarking that it was "too hard."

This movement towards flexibility in the forms of the nouns may be the ultimate outgrowth of the distributional approach to the use of much N and many Ns. However, there are indications that it might also be at least the first step towards placing the mass-count distinction in the quantifiers much and many, leading away from a strict distributional categorization of these forms towards a semantic categorization. Three characteristics of the data at 8 and 8½ suggest that, indeed, a switch to a semantic approach may be taking place. First, at 8½ there is a marked improvement in children's responses to the stimuli in noun class F, the "opaque" nouns (up to 75%, from an average of 55.5% at the previous four ages). While this may be due to greater familiarity with the number status of these nouns, it could also reflect the child's use of semantic over morphological criteria in judging the appropriateness of these forms.

Secondly, in responses to the NMW's, the age groups between 6;0 and 8;0 judged with 85% accuracy that many+the plural form of a NMW was correct. However, at 8½, subjects judged this construction to be correct only 50% of the time, and in half of their corrections, they substituted much for many, yielding constructions such as "Big Bird didn't see much stacks of fish" and "Mickey Mouse didn't draw too much heaps of fish." This type of construction violates the surface distributional privileges of much and many, but it is possible that it stems from a new understanding of the semantic functions of NMW's. It has often been pointed out that NMW's provide individuated measures for mass nouns, but they also "massify," if you will, count nouns — bringing together masses of units into new units. This realization seems to underlie a related error produced by my daughter when a friend, aged 7½, asked, in a conversation, "How much people did you see?" and "How much cars did you see?" I asked my daughter, Rachel (9;5), if these sentences were appropriate, and she immediately corrected them to the corresponding sentences with many. When asked further if one could ever say "how much people" or "how much cars," Rachel offered, "You could say, 'How much crowds of people' and 'How much bunches of cars.'"

The third characteristic of the data from the 8- and 8½-year-olds that suggests a movement from a distributional to a semantic approach to the mass-count distinction has to do with responses to the nonsense words. While the average accuracy in responses to the first seven types of nouns continually increased from 6½ to 8½, responses to the nonsense words decreased at 8 and 8½ from a high of 59.4% and 56.3% at 7 and 7½ to 43.8% and 40.6% at 8 and 8½. Because nonsense "words" would provide no semantic information, it would be difficult for a child who is basing decisions on

semantic information to judge whether a given mass or count construction was appropriate. Interestingly, although some children at all ages between 5½ and 8½ responded to the nonsense constructions by asking "What's tiv/blick/etc.?" or by merely stating that they didn't know how to answer, the greatest percentage of children responding in one of these fashions was in the 8½-year-old group (33.3% of the children responding in this fashion; 40.6% of the responses at 8½ involved this type of response.)

Conclusion

This study explored children's understanding of the mass-count distinction as it applies to constructions involving *much* and *many*. The results, taken together with those of previous studies, suggest a prolonged development of the mass-count distinction in English that begins perhaps as early as 3 years of age and may not be complete until after age 9. The data in Brown (1970) indicate that by 4 or 5 years of age, children differentiate the modifiers *a* and *another* from *some* and *any* when these modify singular nouns, associating individuated objects with the former and non-individuated substances with the latter. The data reported here suggest that by age 6½ or 7, children are aware of the correct forms of mass and count nouns when they occur in quantified constructions. It is not entirely clear, however, whether knowledge of the correct shape of these nouns entails distinguishing between mass and count senses of the words. The data reported in Gathercole (1981) indicate that children up to the age of 6 do not yet have a clear notion of mass vs. count as a categorization principle for nouns, since 5- to 6-year-olds treated all instances of *more N* as referring to relative numbers of items. However, it is possible that by 6½ or 7, children have gained a more mature understanding of this distinction as it relates to nouns in English. Subsequently, by the age of 7½, children recognize that *many* must occur with plural forms of nouns, and that singular forms of nouns must occur with *much*, but they do not yet know that *much* cannot occur (except in a few exceptional cases) with plural forms of nouns. Finally, there is some indication in the data presented here that children around the age of 8½ and beyond may move to a more semantic understanding of the mass-count distinction, in which nominal forms become more flexible in distribution, and in which the mass-count distinction is transferred to the quantifiers modifying those nouns.

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